

XV.—*Insect-Pests belonging to the Homopterous Family Coccidæ.*

By E. T. ATKINSON, B. A., PRESIDENT.

[Received and read July 7th, 1886.]

In a recent paper on the Homopterous section of the Indian Rhynchote, it was remarked (p. 205 *supra*) that the group to which the *Coccidæ* belong had been practically unworked in India, and that whoever takes them up will probably have little aid from what has been written about them. Further research shows no reasons for modifying this statement; and the object of the present paper is to introduce the family to the notice of observers in India.

The more immediate cause of the early appearance of the paper is the receipt of letters from Ceylon asking for aid in the discrimination of Ceylonese species, and, as the inquiry is still in its infancy, it appears to me that the better plan will be to publish extracts from these letters in our Proceedings and invite the aid of those who are inclined to assist in this investigation. This aid may be afforded by collecting specimens *in spirits*, accurately watching and recording transformations and the seasons at which these occur; the soil, aspect, climate which appear to favour or retard the spread of the insects; accounts of any experiments for destroying the pests; general and particular effects of each species on tea, coffee, chinchona, or other economical products, local history of first appearance, continuance, &c., enemies of the pests, whether Hymenoptera, Coleoptera, or Acari.

## COCCIDÆ.

*Coccus*, Linn. : *Coccidæ*, Leach, Westw. : *Gallinsecta*, Latr. : *Coccides*, Sign.

The insects of this family are commonly known as scale-insects or gall-insects and some of them, from the white farinose substance secreted by them, as mealy-bugs. They are common on almost all trees and plants in all parts of the world, and frequently commit great havoc on those cultivated for food or industrial purposes such as the coffee, tea, chinchona, orange, lemon, apple, and other fruit-trees: with the exception of the *Carteria lacca*, Ker, and a few others, their history has never been studied in India, and it is with the object of showing the character and forms of these insects sufficiently to aid in their determination that the following outline history of the family is given. It is chiefly based on the writings of Bouché, Costa, Westwood, Targioni-Tozzetti, Signoret, Maskell, Comstock, and Löw.

The Linnæan genus *Coccus* was divided by Geoffroy into two sections,

(1) *Chermes*, Geoff. nec. Linn. including those having the form of a shield and (2) *Coccus* for the remainder. Bouché further separated the genus *Chermes* of Geoffroy into two divisions, (a):—those in which the body itself of the insect has or assumes the shield-like form, and (b):—those in which the insect is concealed beneath a distinct moveable shield. It is, however, to the works of Targioni and Signoret that we have to look for the systematic classification of the insects of this family and for those characteristics common to nearly all the species on which the family is founded. The larval form has six legs, two antennæ, and two eyes, and there is no visible distinction between the sexes: the adult ♀ has usually neither wings, legs, nor antennæ, but is furnished with a setiform rostrum or sucking apparatus: the adult ♂, on the other hand, has two wings, two processes similar to the halteres of the Diptera in place of hind-wings, legs, antennæ, two and sometimes four eyes, but no rostrum: the adult ♂ also is less common than the adult ♀, indeed in some genera has not yet been discovered.

Signoret distributes the genera of this family amongst four subdivisions or sub-families:—

*Diaspina*:—Comprising those insects which are covered by a scale or pellicle composed partly of the exuvie or moulted skins of each transformation and partly of a secretion formed by the insect itself and which is attached to the cast-off skin, the two forming a shield more or less independent of the body of the insect and which is variously called scale, shield, buckler, test, or puparium (*bouclier, schild*).

*Brachyscelina*:—Comprising species living in tubes or galls and of which the ♀ resembles the ♀ of the preceding sub-family and the ♂, with its hook-shaped genital sheath, furnished with lateral filaments, the ♂ of the *Coccina*.

*Lecanina*:—Comprising species either naked or inclosed or simply covered with a waxy or filamentary or even calcareous material: most of the ♀ take on an entirely different form after impregnation and then fixed to their food-plant remain so fixed for the rest of their lives. The lower-lip is one-jointed: the anal extremity is cleft and has two triangular lobes or plates above the cleft.

*Coccina*:—Comprising species in which the adult ♀ is naked or is covered more or less with a whitish waxy matter, varying much in form and consistence: the lower-lip is 2—3 jointed; the anal extremity is not cleft, but is produced in two tubercles more or less developed and prominent, each of which is furnished with a long bristle: the triangular lobes or plates of the *Lecanina* are wanting: at the last stage the ♀ is usually inclosed in a cottony or felted or calcareous envelope that forms a receptacle for the eggs.

## Subfamily DIASPINA.

*Diaspides*, Sign., A. S. E. F. (4 sér.) ix, p. 98, 109 (1869): *Diaspida*, Maskell, Trans. New Zeal. Inst. xi, 189 (1879): *Diaspina*, Comstock, Rep. Dep. Agr. U. S. p. 278 (1880): *Diaspida*, F. Löw, Verh. zool-bot. Ges. Wien, xxxii, p. 513 (1883).

The genera falling under this subfamily, as we have seen, are distinguished by a shield or covering formed partly of the cast-off skins of the earlier stages and partly of a filamentary addition thereto secreted by the insect itself. Dr. F. Löw (l. c.) has recently bestowed some attention on the metamorphoses of this group, and I shall incorporate the result of his investigations in the following account of this subfamily:—

♂. In the adult, the head has four ocelli, two on the underside close to each other and two on the vertex behind the base of each of the antennæ, which are 10-jointed and placed close to each other at the apex of the head, each on a small tubercle: mesonotum in the middle with a transverse band (*apodema*) which is narrow and of equal breadth throughout, somewhat arched, very shining and convex and in most species of a darker colour than the rest of the dorsum. The abdomen is almost as broad as the thorax, broadly rounded at the extremity and furnished there with a knob or protuberance, from which proceeds the genital organ, which is as long as or longer than the abdomen: there are no caudal appendages. Wings oval, the basal lobe but slightly projecting; the hind-wings are wanting and are replaced by a pair of usually clavate processes, resembling the halteres or poisers of the *Diptera*, and furnished with a hooked bristle which fitting into a pocket or hollow in the fore-wings steadies them in flight. Legs moderately long; femora tolerably stout, somewhat flattened and with a notch on the underside near the base; tarsi with one joint, conical and ending in a simple claw and four knobbed hairs called digitules. The ♂ rests as larva and pupa under a variously shaped shield which is composed of a single larval skin and of an appendage formed of a stiff (neither filamentous nor felted) secretion, the latter attached to the margin of the former.

♀. In the adult, the body is circular, pyriform, oval, or longish-elliptical, strongly depressed, without any of the external organs except the rostrum or sucking setiform apparatus. Last abdominal segment (*pygidium*) very flat, sharp-edged, roundish, semi-circular or obtusely triangular, undivided, furnished on the posterior margin with small lobes, spines, hairs, and scales. There are visible under the microscope by transmitted light on the upper side of this segment a number of



organs in the form of circular openings (*pores*) or tubes, which are either collected in groups or stand in irregular rows along the margins, and which are probably organs of secretion, hence the name spinnerets (*filières*). These organs afford specific and generic characters of value. The female individuals lie either in all stages free beneath a variously formed shield, which is made up of two larva-skins each with an appendage of stiff secretion at its margin, or they are enclosed as mature females in the second of the skins included in the shield, and then only the first skin possesses a secretional appendage. We shall now further examine the shield.

This shield varies much in shape and colour according to genus and species. As observed before, it is composed of the cast-off skin and a secretion formed by the insect itself. In the ♀ there are two of these cast-off skins present in the shield and in the ♂ but one. In both sexes the larvæ possess six legs, antennæ, and a rostrum, and are not distinguishable from each other. They attach themselves to the food-plant on which they live by the rostrum or sucking apparatus, and the abdomen soon begins to grow, the extremities, however, remaining of their original size. In this stage there is no shield, but, after the lapse of a few days, the first moult takes place, and the cast-off skin preserves the characters of the change that then takes place. From an examination of this skin it appears that, contrary to the process obtaining in the *Cicadæ* and other families of the Homoptera, in the first shedding of the skin the dorsal portion is entire, and it is the lower side of the front portion of the abdomen that bursts and allows exit to the insect. The skin of the dorsum is compact or felted and semi-corneous, whilst that of the sternum and foreparts of the abdomen is comparatively soft and delicate; and these characters are preserved in the exuviæ, which show the dorsal portion entire and the sternal portion burst open and often unevenly torn in the process. The larva then commences to deposit a secretion on the edge of this skin so as to gradually form an appendage varying in shape and colour according to the genera and species, and which together with the exuviæ form the shield under which the larva lives. Up to this point in their history there is no difference in the development of the sexes, but here they diverge.

♂. According to Dr. Löw, when the shield has been formed as above described, a second moult takes place and this time the dorsal surface bursts and the very delicate cast skin is not incorporated with the shield but is extruded posteriorly: the shield remaining the same. The appendage to the first larval skin formed by the added secretion varies in the different genera; in *Aspidiotus* and *Aonidia* this secretion surrounds the larval skin as a more or less broad, circular, oval or elongate-oval



border, which is more or less convex according to the shape of the larva within it. It is attached too to the larval skin in such a way as to place the skin somewhat away from the middle towards the side of the shield. In the other genera, the larval skin lies at the base of the shield, whilst the attached secretion forms a straight caudal appendage, which is not so broad as, or but a little broader than, the larval skin itself. In *Diaspis* and *Chionaspis*, this appendage is parallel-sided, flat, with the sides and the middle longitudinally ridged, whilst in others it is convex, fluted, highest next the hinder end of the larval skin, and posteriorly generally somewhat flattened, with the sides parallel or a little dilated. The next change produces the adult ♂ already described.

♀. When the larva, after casting the first skin as already explained and after adding to it a secretion to form a shield, has attained to a certain age, it undergoes a second moult beneath the shield and becomes a fully developed female. The process undergone indicates two separate groups, which may be thus distinguished:—

(a). *Aspidiotaria*:—in the genera *Aspidiotus*, *Diaspis*, *Targionia*, *Parlatoria*, *Chionaspis*, and *Mytilaspis*, the ♀ completes the second moult exactly like the first, bursting through the skin on the underside, and the second skin, like the first, is shield-shaped, compact, felted, and entire, and becomes attached to the inner side of the first skin so as to form a part of the shield, under which the insect moves freely about. The perfect ♀ then completes the shield by adding to it an appendage formed of the same secretion as that produced by the ♂.

(b.) *Leucaspia*:—in the second group, formed of the genera *Leucaspis*, *Aonidia*, and *Fiorinia*, the second moult does not take place by the bursting of the skin, but the body shrivels up towards the head and thus becomes detached from the skin. The insect remains enclosed in the skin as in a cocoon, and the skin retains the shape and size of the larva from which it has been shed and is as large, or nearly so, as the shield which was already formed when this second moult took place, and adheres rather firmly to it. Above, it is compact and felted, below soft and thin, and completely envelopes the female, which ceases to grow and is, in fact, smaller than in the preceding larval stage. Therefore, in species belonging to this sub-family, the ♀ can be at once recognised by the presence of two cast-off skins in the shield, the first of the first moult with an appendage formed by the secretion referred to, and which varies in form with the genus, and, below it and to a certain extent behind it, the larger cast-off skin of the second moult, covered partly by the first skin and partly by its appendage. In those cases in which the adult ♀ is free, this second larval skin has a further secretion of its own, but in the second group, where the ♀

is inclosed, there is no such secretion. In no case is the shield composed of cast-off skins alone, and, where it appears so, closer examination will show the secretion.

In the ♀ as in the ♂, the shape and colour of the shield varies with the genera and species. In *Aspidiotus*, *Diaspis*, *Aonidia*, and *Targionia*, the shield is circular or oval with the first larval skin in or near the middle; in *Parlatoria* and *Leucaspis* it is produced, oval, with the first larval skin at or near the apex; in *Fiorinia* it is elongate and with parallel sides, and in *Chionaspis* and *Mytilaspis* it is mussel-shaped. Dr. Löw further observes\* that the shields in the ♂ are smaller, narrower, and often quite differently formed from those of the ♀, so that, if we find one with a single larval skin attached, this character will help us to ascertain whether the insect beneath is a ♂ or ♀,—if the specimen be a ♀, it must be in the last larval stage, if it be a ♂, it must be either a larva or a pupa. In examining the ♀ of the second group above noticed, in which the ♀ is completely enveloped, care must be taken not to mistake the second larval skin for a dead larva. If it appears as a small thin pellicle not attached to the shield, it is a dead larva, but if be a stiff, semicorneous body attached by its dorsum to the first skin, it is the second larval skin and beneath is the living female. The following table gives Löw's arrangement of the genera of this group.

#### *Table of Genera.*

A. *Aspidiotaria* :—The perfect ♀ not enclosed in the second (lower) larval skin, which forms a portion of the shield, and which itself is smaller than the perfect shield and has a secretional appendage on its border.

a. Shield in ♀ circular or broadly oval, with the first larval skin placed in or near the middle.

a. Shield in ♀ flat, plate-shaped, not closed beneath.

1. Shield of ♂ oval or ovally produced, the larval skin placed somewhat away from the middle :—*Aspidiotus*, Bouché [Sign., A. S. E. F. (4 sér.) ix, p. 113, 1869].

2. Shield of ♂ long with almost parallel sides, scarcely broader than the larval skin which is placed at its apex with median and lateral longitudinal ridges :—*Diaspis*, Costa [Sign., l. c. 431].

b. Shield of ♀ highly convex, hemispherical, closed beneath by a

\* Where there is difficulty in detecting the construction of the shield, the same writer recommends its being dissected in a solution of caustic potash or boiling water.

secretional layer or plate; shield in ♂, produced ovally, larval skin almost at the apex:—*Targionia*, Sign. [l. c. x, 105].

b. Shield in ♀ produced ovally or mussel-shaped, *i. e.* narrowed in front and gradually widened behind: first larval skin at the apex or very near it.

a. Shield of ♀ long, oval or elliptic: larval skin placed at the apex or near it: body of ♀ broadly oval: shield of ♂ long, narrow, with almost parallel sides:—*Parlatoria*, Sign. [l. c. ix, 450].

b. Shield of ♀ narrow at the apex, gradually widened towards the posterior part, mussel-shaped: larval skin placed at the apex: body of ♀ ovally produced or in form of an ellipse.

1. Shield of ♀ brown, more or less transparent: shield of ♂ brown, narrow, elongate, convex like that of the ♀. *Mytilaspis*, Targ. [Sign., l. c. x, 91: includes *Lepidosaphes*, Shimer].
2. Shield of ♀ white, opaque: shield of ♂ white, long, narrow, with nearly parallel sides, scarcely broader than the larval skin, flat, with median and lateral longitudinal ridges:—*Chionaspis*, Sign. [l. c. ix, 442].

B. *Leucaspriaria*:—Adult female enclosed in the second (lower) larval skin, which forms a portion of the shield, which is itself as large or nearly as large as the perfect shield and has no secretional appendage.

a. Shield of ♀ ovally produced or with parallel sides: the first larval skin ovally produced and placed at the apex of the shield.

1. Shield of ♀ ovally produced, white: the first larval skin yellowish or brownish, the second pitch- or red-brown: shield of ♂ very long, narrow, pure white, very convex behind the yellowish larval skin, somewhat flattened posteriorly:—*Leucaspis*, Sign. [Sign., l. c. x, 100].
2. Shield of ♀ narrow at the apex, then abruptly widened and produced, with almost parallel sides, delicate, brownish-yellow: shield of ♂ of the same shape but much smaller and narrower:—*Fiorinia*, Sign. [Sign., l. c. ix, 449].

b. Shield of ♀ circular or broadly-oval, rather flat: the first larval skin oval or almost circular, placed in the middle or slightly away from the middle of the shield: shield in ♂ oval, with the larval skin away from the middle:—*Aonidia*, Sign. [Sign., l. c. x, 102].

Maskell [Trans. New Zeal. Ins. xii, p. 293, 1880] has created a genus *Poliaspis*, which he describes as possessing the same character as *Leucaspis*, but it has also a fringe of spiny hairs set close together around the edge of the abdomen, which fringe is absent in *Leucaspis*.



Although no species of this sub-family has been recorded from India, we may reasonably expect to find the following or their representatives.

- Aspidiotus aloes*, Boisd., on *Aloe umbellata* [Sign., A. S. (5 sér.) ix, p. 114, 1869.]  
 „ *buddleiæ*, Sign., on *Buddleia salicina* [Sign., l. c. 115.]  
 „ *caldesii*, Targ., on *Daphne collina* [Sign., l. c. 116].  
 „ *ceratonie*, Sign., on *Ceratonia siliqua* [l. c. 118].  
 „ *chamæropsis*, Sign., on species of *Chamærops* [l. c. 118].  
 „ *destructor*, Targ., on palms, guavas [l. c. 121].  
 „ *nerii*, Bouché, on *Nerium oleander* [l. c. 126].  
 „ *pandani*, Boisd., on species of *Pandanus* [l. c. 131].  
 „ *palmarum*, Bouché, on species of *Chamærops* [l. c. 131].  
 „ *bicarinatus*, Walker, from China [l. c. x, 107].  
*Diaspis boisduvalii*, Sign., on orchids [l. c. ix, 432].  
 „ *bromeliæ*, Kerner, on pine-apple [l. c. 434].  
*Fiorinia pellucida*, Sign., on Areca palm [l. c. 449].

#### Sub-family BRACHYSCELINA.

*Brachyscelides*, Sign., A. S. E. F. (4 sér.) ix, p. 100 (1869) ; (5 sér.) vi. p. 591 (1876).

This sub-family was created by Signoret to contain several genera from New South Wales described by Schrader [Trans. Ent. Soc. Sydney, i (i), p. 1, 1863] and which live in galls or tubes on the *Eucalyptus* and other allied trees. The greater number of the galls of *Brachyscelis* were found on *E. hæmostoma*, though *E. corymbosa* and *Angophora lanceolata* were also infested by them. In *Brachyscelis*, the galls of the ♂ are trumpet-shaped and, in the figure given by Schrader, are attached to the underside of the leaf, whilst those of the ♀ are of an elongated bell-shape, with a cap which falls off when the gall arrives at maturity, and are usually placed on the small branches. At the end of this gall is found an opening or notch such as might be made by a knife and through it the ♀ receives air and also the larvæ escape. The two abdominal setæ of the ♀ appear through this orifice, which is always surrounded with a white farinose secretion. The larva is flat, nearly transparent, and of a yellow colour: the sides are furnished with hairs arranged in one row and there are two long anal setæ: the antennæ are about half the length of the body, 7-jointed and each armed at the tip with two small and two long hairs: tarsi 3-jointed, the last joint with a claw, which is also furnished with some small hairs. The adult ♂ is about two lines long, of a yellow colour and has one-jointed tarsi ending in two claws, one being stronger than the other: the anal setæ are nearly twice as long as the body; the wings contain two longitudinal veins: antennæ with ten-joints, which are neither very

distinct nor regular: eyes prominent. These insects have hitherto been found only in Australia, but it is possible they may be found on the *Eucalyptus* imported thence and now common in India. The genera created by Schrader are:—

1. *Brachyscelis*, in which ♀ has six legs complete, but short and unfit for use.

2. *Opisthoscelis*, in which ♀ has only two long posterior legs.

3. *Ascelis*, in which ♀ is apodous.

In *Opisthoscelis*, the galls of both sexes are often found under the same leaf: that of the ♀ is in the shape of a pea, but somewhat larger; that of the ♂ is very small and conical. The ♀ of *O. subrotunda* is of a crimson red colour, nearly round, but the terminal segment of the abdomen is very much tapered; the ♂ is of a red colour, with anal setæ; the body, legs, and antennæ are very hirsute: long about 2".

In *Ascelis*, the ♀ larvæ alone form galls; the ♂ undergoing its changes within the gall of the parent ♀. This ♀ is of a pale yellow colour, the segments are hardly visible, and it appears as a mass of apparently inert matter without external members. The dorsum has a three-pointed corneous process, which always holds some gum apparently intended to close the opening of the gall, which is here always on the upper side of the leaf to which the gall is attached. The galls are usually of a large, globose form, and also in the form of large flat swellings on both sides of the leaves. The larva is flat and transparent, and resembles that of *Brachyscelis*, except that it is more pointed at the apex, has shorter antennæ, short anal setæ, and has not so much hair fringing the abdomen. The ♂ larva changes in the parent gall to a second form, which is red, active, and somewhat longer than the first change, but narrow and with very short anal setæ; after this it changes to a pupa and then to an imago, which is also of a crimson colour.

#### Subfamily LECANINA.

*Lecanides*, Sign., A. S. E. F. (4 sér.) ix, p. 100 (1869); (5 sér.) x, p. 268 (1870).

*Lecanidæ*, Maskell, Trans. New Zeal. Inst. xi, p. 203 (1879): *Lecaninæ*, Comstock, Rep. Dep. Agr. U. S. p. 278, 330 (1880).

This group comprises those genera in which the insect is either naked or inclosed, clothed with a waxy or cottony substance, or even completely enveloped, and in such case the ♀ rests naked on its food-plant and forms a cottony secretion between the abdominal skin and the bark in which the eggs are placed. The form varies much; sometimes flat or globular, oval or circular, soft or semi-corneous. The rostral filaments have their source between the first pair of feet and

first are directed towards the anal extremity and then turn backwards through a groove at their source. In the *Diaspina*, the rostral filaments are entirely free from their source; here in addition they are furnished with a one-jointed lower lip. In the *Coccina*, this lower-lip is 2—3-jointed. The antennæ are small, in the young insect and 6—7-jointed; in the adult 7—8-jointed; the two first joints are stout, short, the third generally longest, the last the most pubescent. Feet short, tarsi one-jointed, with a single claw accompanied by four hairs (*digitales*), of which the two upper are long and end in a small knob and the two lower are short and clavate. The body is usually ciliated and in some genera fringed. The ♂ in the larval and pupal stages is like the ♀; before entering the adult stage, a whitish or sometimes felted waxy pellicle is formed above which is detached from the body and beneath which appear the abdominal filaments. The adult ♂ has usually a small head, angular in front and on the sides, with several eyes and ocelli: in *L. aceris* there are ten in all, in others four, six, or eight: the antennæ are large and pubescent, usually ten-jointed, of which 4—6 joints are the longest, the last joint has sometimes hairs differing in size and shape: thorax more or less large, more or less gibbous with a band (*apodema*) more or less prominent, and often darker than the rest of the thorax: wings membranous, hyaline, pubescent, with a single vein, which bifurcates near the base and sends one branch to the costal, the other to the internal margin: in place of hind-wings are processes similar to the halteres or poisers of the *Diptera* which end in 1—3 bristles, curved at the tip: the abdomen ends in a tubercle furnished with a process directed downwards and protecting the genital organ: on each side are two long cottony threads secreted by the spinnerets, accompanied by several rather long hairs around which this cottony matter adheres.

The following subdivisions of this sub-family are suggested by Signoret or by his descriptions:—

1. *Lecaniodiasparia*:—Species having the shield-like form of the *Diaspina* and the anal lobes and lower lip of the *Lecanina*: inclosed in a complete sac or envelope: adult ♀ without legs or antennæ or the latter only represented by stumps: the ♀ after laying her eggs within the envelope shrivels up towards the head: young sometimes viviparous.

2. *Signoretaria*:—Similar to the preceding, but legs and antennæ present in the adult ♀.

3. *Ceroplastaria*:—Species in which the adult ♀ is covered with a waxy layer having the tessellated appearance of the carapace of a tortoise.



4. *Pulvinariaria* :—Species in which the body is naked, but secretes a cottony mass in which the eggs are laid.

5. *Lecaniaria* :—Species in which the body is naked and there is a secretion : often viviparous.

#### Subdivision LECANIO-DIASPARIA.

*Lecaniodiaspites*, Sign., A. S. E. F. (4 sér.) x, p. 273 (1870); *Lecanodiaspis*, (5 sér.) i. p. 422 (1871).

*Lecanio-diaspidæ*, Maskell, Trans. New Zeal. Inst. xi, p. 205 (1879). *Lecanio-coccidæ*, pt., *ibid*, xiv, p. 223 (1882).

This group includes those genera in which the adult ♀ is without legs or antennæ and is inclosed in a sac or envelope with a fringe around the body more or less visible but always present: the upper portion of this envelope appears to be formed by the larva and the lower portion by the adult insect: the ♀ lays her eggs within this envelope and to make room for them shrivels up towards the head so as to be hardly visible: the young are sometimes viviparous. The group forms a link between the *Diaspina* and the *Lecanina*, having the shield-like form of the first and the under-lip and abdominal lobes which characterise the second.

1. The apodous adult ♀ inclosed in a firm, globular, irregular, shell, to which it is not attached: the young insect instead of the abdominal lobes of *Lecanium* has the anal tubercles of a *Coccus*: the under-lip of the larval ♀ is 2-jointed:—*Pollinia*, Targ. [Sign., l. c. x, 274.]

2. Shell or envelope more or less flat or convex, firm, and with a regular double fringe around the naked body and on the dorsum a number of tubiform spinnerets secreting a matter isolated like the tubes but together forming a complete envelope: under-lip 1-jointed: *Asterolecanium*, Targ. [Sign., l. c. 276].

3. Shell almost smooth, compact, spherical above, flat beneath, felted, with a well-developed fringe: adult ♀ without feet, antennæ completely atrophied, their place occupied only by circular rings: anal tubercle always present and for this reason Maskell makes it the type of a new subsection *Lecanio-coccidæ*:—*Planchonia*, Sign. [l. c. 282].

4. Similar to *Planchonia* without feet, but with the antennæ present thus connecting with the next group:—*Lecaniodiaspis*, Targ. [Sign., l. c. 285].

5. Maskell [Trans. New Zeal. Inst. xi, p. 208, 1879] subsequently created a genus for an insect in which the young have the abdominal lobes; the shield is glassy and transparent, becoming waxy at a later period and, in one species, felted at the latest stage: the ♀ preserves the feet and antennæ at least until after the young are produced:—*Ctenochiton*.

6. To these add a genus created by Maskell for species in which the adult ♀ has a shield formed partly of the pellicle of the second moult and partly of a firm, apparently chitinous secretion: apodous in the adult stage:—*Lecanochiton*, Mask. [Trans. New Zeal. Inst. xiv, p. 221, 1882].

#### Subdivision SIGNORETIARIA.

Signoret, A. S. E. F. (5 sér.) i, p. 422 (1871).

This group includes species inclosed in a kind of sac or envelope formed by the female at the time of laying her eggs and intended for their protection: this sac varies much in character being in some a mere cottony mass, and in others firm and felted: feet and antennæ present, sometimes atrophied.

1. Species inclosed in a rather thick or felted case formed of a white substance: antennæ 8-jointed in the adult, 6-jointed in the larval ♀:—*Signoretia*, Targ. [Sign., l. c. 426].

2. Species enclosed in a complete envelope or sac in which the adult ♀ is found lying on a cottony mass, its body shrivelled and pushed to one of the extremities in proportion to the number of the eggs: the larval and adult ♀ have 6-jointed antennæ, but the feet and antennæ become atrophied, thick and short, and the joints are scarcely visible: adult ♂ with 10-jointed antennæ: six eyes, two in front of the vertex, two a little beneath and two in place of the rostrum:—*Eriopeltis*, Sign. [l. c. 429].

3. Species inclosed in a sac of a white felted substance: anal ring round in front and behind and with eight hairs on the recurved extremity: antennæ of ♀ with six joints in the larval, pupal, and adult states. *Philippia*, Targ. [l. c. 433].

#### Subdivision CEROPLASTARIA.

Sign. A. S. E. F. (5 sér.) i, p. 423 (1871).

This division includes those species which are covered by a layer more or less thick of a waxy substance that forms in some a covering resembling the carapace of a tortoise and in others one resembling a star-fish. It includes the genera *Vinsonia* and *Ceroplastes*, the former of which combines the tortoise-shaped disc of the dorsum with star-fish limbs, whilst the latter is without arms. From Signoret's remarks [l. c. iv, p. 98, 1874] we should place here the genus *Fairmairia*, Sign., to contain species having a scaly covering of a mother-of-pearl consistence in the form of a tent or of two leaves leaning against each other; composed of a circular-rayed secretion that increases in con-

centric circles formed each below the other. The larva is flat, twice as long as broad; as it grows it becomes higher than broad, but still keeping its elongated form;  $2\frac{1}{2}$  times as long as broad, very convex above and flat beneath: it preserves its limbs and antennæ, which are 6-jointed in the larva and 8-jointed in the adult.

Genus VINSONIA, Signoret.

A. S. E. F. (5 sér.) i, p. 423 (1871); ii, p. 33 (1872).

Insects in which the pellicle covering the body is of a waxy appearance, corneous, transparent, forming on its disc a tortoise-like tessellation and having seven rays or arms, one corresponding to the head and three on each side corresponding to the stigmata, with a very short one at the anal extremity. The insect beneath is oval, strongly rounded, a little narrowed towards the head: antennæ 6-jointed, of which the third joint is longest and equal to the last three taken together; the sixth is longer than the fourth and fifth and has some hairs; there are two hairs on 1, 2, and 5: rostrum 1-jointed, short: feet slender and short, tibiæ as long as the tarsi.

VINSONIA PULCHELLA, Signoret.

A. S. E. F. (4 sér.) x, t. 7, f. 7 a—d (1870); 5 (sér.) ii, p. 34 (1872).

The ♀ has the appearance of a 7-branched star, and, as it grows older, the secretion fills up the space between the branches of the star, which appear then to be united by a membrane: the disc of the dorsum is convex and semi-globose. This species has been found on the mango in Réunion.

CEROPLASTES, Gray.

Spicil. Zool. p. 7 (1830): Walker, Cat. Hom. B. M. iv, p. 1086 (1851): Sign., A. S. E. F. (5 sér.) i, p. 424 (1871); ii, p. 35 (1872); Comstock, Rep. Agr. U. S. p. 330 (1880).

Species covered with a thick waxy matter which does not adhere to the insect, and which is formed of layers of secretions from the spinnerets. Some of the species have on the dorsum tubercles or tumescences varying in size according to age and which disappear more or less as the insect reaches its full growth, then from being more or less flat with concentric lines and tumescences it becomes globular and smooth: antennæ 6-jointed, of which the third joint is the longest: in the larval stage the fourth and fifth joints appear as one: legs long, tibiæ as long as the tarsi: claw with four digitules, the shorter pair very stout and horn-shaped: ♂ unknown.



## CEROPLASTES CERIFERUS, Anderson.

*Coccus ceriferus*, J. Anderson, Mon. *Coccus cerif.*, Madras, (1791); Corres. Madras, p. 46 (1800); Pearson, Phil. Trans. p. 333 (1794); Fabricius, Ent. Syst. Sup. p. 546 (1798); Syst. Rhyng. p. 311 (1803); Chavannes, A. S. E. F. (2 sér.) vi, p. 144 (1848); Walker List Hom. B. M. iv, p. 1087 (1851).

*Columnnea ceriferus*, Targioni, Atti Georg. (1866).

*Ceroplastes ceriferus*, Westwood, Gard. Chron. p. 484 (1853); Sign. A. S. E. F. (5 sér.) ii, p. 40, t. 7, f. 3 (1872). J. Wood-Mason, Journ. Agri.-Hort. Soc. India, 1878, v, p. 76.

Insect globular, a little elongate, covered with a white waxy mass; the part resting on the food-plant more or less convex. Found on *Celastrum ceriferum* in Madras: on the kowa or arjoon, mango, pipul, and other trees in Ranchi, Chutiá Nagpur.

## Subdivision PULVINARIARIA.

*Pulvinariæ*, Maskell, Trans. New Zeal. Inst. xi, p. 205 (1879); Sign., A. S. E. F. (5 sér.) i, p. 424 (1871); iii, p. 29 (1873).

This division is formed for the genus *Pulvinaria*, Targ., which includes those species in which the adult ♀ forms a mass of waxy-resinous cottony matter in which the eggs are laid. To this genus belongs the *P. gasteralphe*, Icery, that attacks the sugar-cane in the Mauritius.

## Subdivision LECANIARIA.

Sign., A. S. E. F. (5 sér.) i, p. 424 (1871); iii, p. 395 (1873).

This group includes those species which are naked: they vary in form, flat, or globular, or semi-globose and more or less smooth or rugose. It comprises the following genera:—

1. Species which are naked, flat or globular, smooth or rough, with one joint in the lower lip and having anal lobes or scales:—*Lecanium*, Illig. [Sign., l. c. iii, 395].

2. In which the adult ♀ in its most advanced stage is divided into two equal parts by a film formed of the skin of the abdomen which remains stationary, whilst the insect continues to increase on its dorsal surface until the lateral margins thereof meet and a ball-like form is produced on the underside of which traces of a fissure may be seen:—*Physokermes*, Targ. [Sign., l. c. iv, 87].

3. Species in which the ♀ is spherical, more or less rounded, except where it is attached to its food-plant, and the ♂ occur in masses along and around the branches on which the insect lives: formed for the wax-insect of China:—*Ericerus*, Guérin [Sign., l. c. 90].

4. Body convex above and expanded on the margin; cleft posteriorly, lobes obtuse, approximate, inflexed: antennæ short, conical, 6-jointed, three basal joints large, terminal sub-equal, small: feet robust short, tibia hollowed anteriorly to receive the tarsus, which is ovate, acute, furnished with a pointed claw:—*Lecanopsis*, Targ. [Sign., l. c. 93].

5. Differs from the preceding in having neither feet nor antennæ in the adult state:—*Aclerda*, Sign. [l. c. 96].

6. Created for the lac-insect of India:—*Carteria*, Sign. [l. c. 101]: see A. M. N. H. i. p. 10 (1861) for Carter's description.

#### LECANIUM, Illiger.

Sign., A. S. E. F. (5 sér.) iii, p. 395 (1873).

Signoret includes in this genus species which are naked, more or less flat or globular, smooth or rugose: lower-lip with a single joint: abdomen cleft at the anal extremity and with two triangular lobes or scales above the cleft.

Signoret has divided the genus, which is numerous in species, into six sections or sub-genera:—

1. Insect flat; segments of the body distinguishable; usually viviparous: antennæ in adult ♀, 7-jointed; in larva, 6-jointed:—*L. hesperidum*, Linn.

2. Insect more or less elevated, but elongate, and some having a kind of dorsal ridge: usually oviparous: ♀ ordinarily with 7-jointed and sometimes 8-jointed antennæ, larva with six:—*L. persicæ*, Fabr.

3. More or less elevated, globose, hemispherical; skin of a peculiar tessellated structure: antennæ in ♀, 6—7-jointed. *L. aceris*, Schrank.

4. More or less globose, hemispherical; the skin is perforated with oval cellules or openings; tarsi jointed; antennæ in ♀, 8-jointed. *L. coffeæ*, Walker.

5. In which the skin is rugose and the dorsal disc has one longitudinal and two transverse ridges and is marked by a more or less irregular pattern formed of cellules or openings: antennæ usually 8-jointed.—*L. depressum*, Targ.-Tozz.

6. Entirely globular except the part attached to the food-plant: antennæ and feet wanting:—*L. emerici*, Planchon.

#### LECANIUM HESPERIDUM, Linn.

*Coccus hesperidum*, Linn. Syst. Nat. ii, 739 (1735): Fabricius, S. R. (1803).

*Calymnatus hesperidum*, Costa, Nuov. Obser., t. i, f. 1? (1835).

*Calypiticus hesperidum*, Costa, Faun. Ins. Nap. 8, 1 (1837): Lubbock, Proc. Royal Soc. ix, p. 480 (1858); A. M. N. H. (3 sér.) iii, p. 306 (1859): Beck, Trans. Micr. Soc. (n. s.) p. 47 (1861).

*Lecanium hesperidum*, Sign., A. S. E. F. (4 sér.) viii, p. 856 (1868); (5 sér.) iii, p. 399 (1873): Maskell, Trans. New Zeal. Inst. xi, p. 205, t. 6, f. 12 (1879); xii, p. 292 (1880): Comstock, Rep. Dep. Agr. U. S. p. 44, f. 52 (1876); p. 335, t. 8, f. 2 (1880).

Young insect flat, long, oval, reddish-brown, very active; abdominal cleft visible: antennæ with six joints, the third longest, the fifth having the appearance of two soldered together, the last with a few hairs: tibiæ and tarsi of about equal length; the upper pair of digitules long, the lower short and narrow: the abdominal lobes end in two very long setæ. The adult ♂ is not known.

Adult ♀ oval, varying in eccentricity from a regular ellipse to nearly circular, elongate, flat; yellow, inclined to brown on the disc, often dark; smooth, shining, with a fringe of small hairs not very close together, sparingly punctured on the disc; after death, the border above becomes wrinkled radially for a narrow space. The antennæ are present and are 7-jointed, 1 and 3 joints thickest, 4 and 7 sub-equal in length, and 3 a little shorter, rest shorter and sub-equal. Feet moderately long, coxæ thick, femora moderately large and about the same length as the tibiæ, which are thinner; tarsi still thinner, ending in a claw: upper digitules rather long, ending in a knob; lower pair about twice as long as the claw and very broad.

Maskell notes that beneath the body there is a deep red cavity between which and the food-plant to which the ♀ is attached the young run about. Abdominal lobes cordiform, more distinguishable in the young insect: anal ring surrounded by six long hairs. Long, 3—4 millims.

This species occurs on holly, ivy, ilex, and especially on the orange, and has been found throughout Europe, the United States, and New Zealand, where it does great damage, but varies much in its appearances, being in some years particularly numerous and destructive and in others much less active. The more common parasites of this species in the United States are *Coccophagus cognatus*, *Comys bicolor*, and *Encyrtus flavus*.

#### LECANIUM COFFEEÆ, Walker.

*Lecanium coffeæ*, Walker, List Hom. B. M. iv, p. 1079, (1852): Nietner, Enemies coffee-tree, p. 6 (1861): Targioni-Tozzetti, Cat., p. 37 (1869): Signoret, A. S. E. F. (4 sér.) viii, p. 849, t. 1, f. 16 a, (1868); (5 sér.) iii, p. 435, (1873).

This is the 'brown scale-insect' or 'brown or scaly-bug' of writers. Walker (l. c.) describes it simply as "ferruginous, flat, scale-like, almost round, with transverse ridges: long 2 millims," and remarks



that it destroys the Coffee plantations in Ceylon. ♂. Clear light pinkish colour, slightly pubescent: head transversely ovate-rotundate, narrowed, and angular in front; eyes large, black; ocelli two, small, lateral; antennæ 9-jointed, the second joint smallest, third longest, thence decreasing to the tip. Thorax ample, cordiform, narrowed in front: wings two, hyaline, with two veins, of which the subcostal vein is dark pink, not folded straight down the back when at rest, but half spread out: scutellum ample, transverse, rounded at the apex. Abdomen triangular-subcylindrical, of shrivelled appearance, with two lateral points, one central appendage, and two long, thin, white filaments at the extremity.

♀. Apterous, tortoise-like, yellowish, marbled with grey or light brown, sub-oval, more or less semi-globose according to age, dorsum with one elevated longitudinal and two transverse ridges, uneven: cleft behind, at the extremity of a split bifid, anal flap or lobe of a brown colour: eyes marginal, black: antennæ 7-jointed, the third joint longest: the rostrum with one long sucking bristle. Old individuals are light brown with a dark margin, smooth, semi-globose, fixed to the branch.

Larva of ♀ has two anal filaments, which are lost when the insect undergoes the final moult. The larva and pupa in ♂ and ♀ are active, except the pupa of the ♂, which is plentiful on the underside of the leaves, where the long narrow oval shell under which it rests is easily discovered: this shell is transparent and composed of nine plates of which three are central and three are on either side. Sometimes the entire underside of the leaves is covered with nothing but the pupa of the ♂ all dead. The eggs are oval and of a pinkish colour and are not actually laid by the ♀, but when they are matured the parent dies, her whole interior forming one mass of eggs protected by the shell. The above is Nietner's description of the form found in Ceylon. Signoret describes specimens from Bahia thus:—Brown-red, hemispherical, margins a little flattened: antennæ 8-jointed, third joint longest, 4 and 5 equal, 8 longer than the two preceding taken together: feet long, tibiæ one-third longer than the tarsi, which are articulated: claw very stout, the two lower digitules horn-shaped: anal ring with eight very long hairs, above on the abdomen six hairs, two on each segment at the tip: the stigmatic hairs of the margin very long, very obtuse at the tip and accompanied by two very short ones; the hairs of the circumference obtuse at the tip, greatest length,  $2\frac{1}{2}$ ; broad  $1\frac{1}{2}$  millims. This insect is found on coffee, tea, orange, *Gardenia*, and many jungle trees.

The brown scale-insect is also infested by Hymenopterous insects, perhaps more than the white scale insect or the black scale. These

parasites are very minute and are for the most part of a brilliant metallic blue or green or gold.

#### LECANIUM NIGRUM, Nietner.

Enemies of Coffee-tree, p. 9 (1861). The black scale.

♀. Shield-like, much larger than the brown scale, colour from yellowish grey to deep-brown and almost black, according to age: sub-oval, dorsum with one longitudinal and two concentric oval costæ on the disc, towards the margin slightly rugose. The scale under the microscope is highly tessellated and the anal slit and flap as in *L. coffeæ*: in old ♀ the scale is black with a slight longitudinal costa.

The larva has two long, black, anal setæ and a projectile tube. ♂ scarcely differs from that of *L. coffeæ*, the head and thorax are not so bright in colour, but the wings appear more strongly hyaline. Mr. Nietner remarks that this species occurs alone and in company with the brown scale but is far less common, and Mr. Green notes its occurrence on *Chinchona officinalis* and *calisaya*, *Manihot ceara*, and *Croton tiglium*. It is found with *L. coffeæ* on the coffee-tree, but only in small numbers.

*Trisporium gardneri*, Berkeley: *Syncladium nietneri*, Rabenhorst.

Mr. Nietner remarks that when the scales have been fairly established upon a coffee-tree, the tree becomes covered with a fine black tissue formed of a fungus (*T. gardneri*), which comes and goes after the scale and never alone. At first this fungus has the appearance of a thin, diluted blackwash, but, rapidly increasing in density, within two or three months it quite covers and blackens the leaves and other parts of the tree, finally almost resembling moss. Its period of growth seems to extend over about twelve months, when it is replaced by a young growth or both it and the scale abandon the tree, and when leaving the tree, the fungus peels off in large flakes. Mr. Nietner writes:—"As the occupation of a coffee or any other tree (by scale-insects), gives rise to the appearance of a glutinous saccharine substance (honey-dew, which is either a secretion of the scale or the extravasated sap that flows from the wounded tree, but more probably a combination of both) which disappears with the scale, and as the fungus does exactly the same, I have no doubt that its vegetation depends upon this glutinous saccharine substance." Whether Mr. Nietner's remarks regarding the appearance of the fungus be correct or not, its occurrence with species of *Lecanium* is marked in the United States, Europe (?), and New Zealand. Mr. Maskell particularly notices that plants attacked by insects of this sub-family have their leaves much blackened.

## Subfam. COCCINA.

*Coccides*, Sign., A. S. E. F. (4 sér.) ix, p. 102 (1869); (5 sér.) iv, p. 546 (1874).

♀ varying in form and in the substance of the skin or covering: in the last stage generally inclosed in a sac or envelope secreted at the time of laying the eggs and which is cottony in *Dactylopius*, *Coccus*, &c., felted in *Eriococcus*; globose and more or less scaly or corneous in *Kermes*; calcareous in *Margarodes*; or it is naked and reclines on a cottony cushion as in *Nidularia*. The under-lip is 2—3-jointed: abdominal lobes or plates are absent, but on each side of the abdomen at the anal extremity are tubercles which carry a more or less long bristle. The segments are easily visible in the larva, less so in the adult; each segment has on each side one or more spinose appendages: antennæ vary much in the number of joints, usually six in the larval state and 6—10 in the adult: legs as in all the *Coccidæ*. In the adult ♀ one can find, by maceration in caustic potash, the antennæ sometimes deformed, the feet, but sometimes these are wanting, and the lower-lip always. The ♂ only differ from the ♂ of the sub-family *Lecanina* in the shorter armature: they are small, with long antennæ, generally 10-jointed, filiform, pubescent; four eyes and usually ocelli: wings large, membranous, transparent: halteres 3-jointed: femora long, pubescent; tarsi one-jointed, one-clawed, usually with four digitules: abdomen more or less long and broad with a bundle of hairs on the last segment, whence proceed 2—4 very long threads formed of a white, fragile secretion.

The following subdivisions are suggested in this subfamily:—

1. Species having the globular shape of some forms of *Lecanium* and easily taken for them, but with a multiarticulate under-lip and without the Lecanid abdominal lobes in the larva, though possessing them in the adult stage:—*Kermesaria*.

2. Species of an elongate form resembling the genera of the group *Dactyloparia*, more or less pubescent: antennæ 6—7-jointed: an emargination more or less visible at the end of the abdomen between the lobes, which are furnished with 5—6 hairs, of which one is very long:—*Anthococcaria*.

3. Species varying in form and the number of joints in the antennæ, with an anal ring visible, which has 6—8 hairs and spinnerets secreting a cottony matter: tarsi and claws with digitules: 2—4 filamentary processes at the extremity of the abdomen:—*Dactyloparia*.

4. Species without an anal ring and having merely an opening at the end of the abdomen:—*Coccaria*.



5. Species with only a simple ring at the end of the abdomen : antennæ with 11 joints in the adult ♀, and 10 in the ♂ :—*Mono-phlebaria*.

#### Subdivision KERMESARIA.

Sign., A. S. E. F. (5 sér.) i, p. 425 (1871) ; iv, p. 547 (1874) : Comstock, Rep. Dep. Agr. U. S. for 1880, p. 337.

This group has been formed for the genus *Kermes*, which connects the *Coccina* with the *Lecanina*. At first sight the insect hardly appears to differ from the sixth group of the genus *Lecanium* (p. 281), but is differentiated thus :—Body globular more or less complete or slightly truncate : in the larval state the presence of a more than one-jointed under-lip, the absence of the abdominal lobes or plates and the presence of more or less marked tubercles at the extremity, distinguish them. In the adult state, the antennæ and feet still remain almost normal, but in some species, which have reached the last stage of their life and have secreted their corneous envelope, the antennæ are sometimes deformed and the feet are sometimes absent, and the abdominal lobes resemble those of *Lecanium*. The species of the genus *Kermes* hitherto recorded have been found in Europe and the United States.

#### Subdivision ACANTHOCOCCARIA.

*Acanthococcites*, Sign., A. S. E. F. (5 sér.) v, p. 16 (1875).

This group contains those genera in which the species have an elongate form more or less pubescent, but much less so than in *Dactylopius* : antennæ 6—7-jointed ; an emargination more or less visible between the lobes of the extremity of the abdomen and these lobes with 5—6 hairs, of which one is very long. In the larval state all are the same and have on the lateral margins a fringe of spiny hairs, and in some genera on the median line also. The following gives Signoret's table of the genera [l. c. p. 16].

1. Adult ♀ without legs or antennæ : rostrum arising from a curious tubercle or protuberance on the head : body resting on a cottony mass which extends beyond and covers its margins. The ♂ undergoes its changes in a small cottony envelope : antennæ 6-jointed : wings with a very small lobe near their insertion : halteres with a single bristle : head with 4—6 ocelli. Larva with 6-jointed antennæ in ♀, 7-jointed in ♂ : adult has the dorsum covered with a transparent waxy and knobbed secretion :—*Nidularia*, Targ. [Sign., l. c. p. 17].

2. Adult ♀ with legs and antennæ : rostrum not arising from the usual place between the first pair of feet, without a tubercle : body

surrounded with a white cottony substance covering all except the dorsal disc:—*Gossyparia*, Sign. [l. c. p. 20].

3. Adult apodous, antennæ in form of a short many-jointed stump, body elongate, cylindrical, thrice longer than broad: rostrum in young with a 2-jointed under lip: anal ring large, in form of a broad circle, finely punctured and striated transversely, with six hairs not extending beyond the abdomen:—*Antonina*, Sign. [Sign., l. c. p. 24: includes? *Laboulbenia*, Licht., M. T. Schwer. Ent. Ges. v, p. 299, 1878].

4. Adult in most advanced stage with only last pair of feet, antennæ absent: body globular, rounded; abdomen not visible; a very great mass of white cottony matter secreted by the insect and forming an appendage:—*Capulinia*, Sign. [l. c. p. 27].

5. Species enclosed in a simple felted envelope and preserving the members during all stages of their existence: antennæ in ♀, 6-jointed; in larval ♂, 7, and in adult ♂ 10-jointed:—halteres with a simple bristle: style very short: knobbed hairs on some of the joints of the antennæ:—*Eriococcus*, Targ. [Sign., l. c. p. 29].

6. Species enclosed in an envelope which is pointed at both ends and of a greyish-yellow: *Acanthococcus*, Sign. [l. c. p. 34].

7. Species naked until fully grown, then the ♀ forms a dense sac of waxy matter within which the eggs are laid: the full-grown ♂ makes a similar sac or envelope within which it undergoes its last metamorphosis; antennæ of larva and adult ♀, 7-jointed: anal ring with eight hairs: four digitules:—*Rhizococcus*, Sign. [l. c. p. 36: Comstock, Rep. Dep. Agr. U. S. for 1880, p. 339].

8. Add perhaps species in which the adult ♀ has the body egg or pear-shaped, not depressed, covered with a waxy envelope: antennæ and feet absent: rostrum very short, conical, not jointed: anal segment semiglobose, rest of the body of a more firm consistence and furnished with an anal chitinous cone emitting a long, hollow filament formed from the secretion: larva with 6-jointed antennæ and feet:—*Xylococcus*, Löw [Verh. Zool. Bot. Ges. Wien. xxxii, p. 274, 1882].

9. Also add species in which the adult ♀ is inclosed in a sac elliptical in outline, very convex above, formed of a continuous waxy secretion: ♀ itself elliptical, with neither legs nor antennæ: two anal tubercles: anal ring with eight spines: under-lip 2-jointed:—*Cerococcus* Comstock [Rep. Dep. Agr. U. S. 1881-82, p. 213].

10. Add also a species forming a connecting link between the *Coccina* and the *Phylloxera* group of the *Aphidæ* having the head, thorax, and abdomen reunited as in the latter: ♂ entirely apterous:—*Ritsemia*, Licht. [Compt. Rend. Ac. Sc. France lxxxviii, p. 870, 1879].

## Subdivision DACTYLOPARIA.

*Dactyloplites*, Sign., A. S. E. F. (5 sér.) v, p. 305 (1875).

This group contains those species in which the genital ring is visible and has 6—8 hairs, and spinnerets secreting a cottony substance that form a more or less truncated point at the anal extremity of the abdomen between the abdominal filamentary processes of which two or four are also present. On the tarsi and claw are digitules dilated at the tip.

1. Larval ♀ with antennæ having 6-joints, adult ♀ with 8; larval ♂ with 7 joints: four digitules: anal ring with six hairs:—*Dactylopius*, Sign. [l. c. p. 306].

2. Larval ♀ with antennæ having 6 joints, adult ♀ with 9; larval ♂ with 7 joints: only two digitules:—*Pseudococcus* Westw., Sign. [l. c. p. 328: Comstock, Rep. Dep. Agr. U. S. for 1880, p. 345].

3. Larval ♀ and adult ♀ with antennæ having 6 joints; larval ♂ with 7: tarsi without digitules:—*Ripersia*, Sign. [l. c. 335].

4. Larval ♀ with antennæ having 6 joints; adult ♀ and larval ♂ with 8: lower lip very short, rostral filaments very short:—*Westwoodia*, Sign. [l. c. 337].

5. Extremity of abdomen with four filamentary processes, no digitules:—*Oudablis* [Sign. l. c. 338; B. S. E. F. (6 sér.) i, p. clvii, 1880: includes *Boisdwalia*, Sign.].

6. Eyes in ♀ prominulous; in ♂ there are twelve, of which four are large, and eight ocelli: no digitules dilated at the tip: eight hairs on the anal ring: two bristles on the halteres: antennæ with nine joints in ♀, ten very long in ♂:—*Puto*, Sign. [l. c. 341, and 395, includes *Putinia*, Sign.].

7. To this may be added the genus *Tetrura*, Licht. [B. S. E. F. (6 sér.) ii, p. lxxv, 183] to contain *C. rubi*, Schranck.

## Genus DACTYLOPIUS, Costa, Sign.

Faun. Regn. Nap. Gallins. p. 15 (1835): Sign. A. S. E. F. (5 sér.) v, p. 306 1875: [includes *Diaprostocetus*, Costa, olim].

Antennæ of the larval ♀ with six joints; of the larval ♂ with seven joints; of the adult ♀ with eight joints: six hairs on the anal ring at the extremity of the abdomen: two digitules on the tarsus and two on the claw.

## DACTYLOPIUS ADONIDUM, Linn.

*Coccus adonidum*, Linn., Syst. Nat. p. 740 (1767): Geoffroy, Ins. i, p. 511 (1764): Fabricius, Syst. Ent. p. 743 (1775); Spec. Ins. ii, p. 393 (1781); Mant. Ins. ii, p. 318 (1787); Ent. Syst. iv, p. 224 (1794); Syst. Rhyng. p. 307 (1803);



Gmelin ed. Syst. Nat. i (4) 2215 (1788) : Olivier, Enc. Méth. vi, p. 91 (1791) : Haworth, Trans. Ent. Soc. i, p. 308 (1812) ; Bouché, Schädling Gart. Ins. p. 51 (1833) : Burmeister, Handb. Ent., ii, p. 74, t. 2, f. 2 (1835) : Amyot and Serville, Hist. Nat. Ins. Hém. p. 629 (1843) ; Walker, List Hom. B. M. iv, p. 1080 (1852).

*Pediculus coffeæ*, Lederman, Microscop, t. 9 (1762).

*Diaprostocetus adonidum*, Costa, Prospetto di una &c. (1828).

*Trechocorys adonidum*, Curtis, Gardiner's Chron. iii, p. 443 (1843).

*Coconidia*, Amyot, A. S. E. F. p. 476 (1848).

*Pseudococcus adonidum*, Nietner, Obs. Enemies of Coffee-plant Ceylon, p. 4 (1861).

*Dactylopius adonidum*, Targioni-Tozzetti, Cat. p. 32 (1868) : Signoret, A. S. E. F. (4 sér.), viii, p. 842 (1868) ; (5 sér.) v, p. 307, t. 6, f. 1, 1a, a d (1875) : Comstock, Rep. Agr. Un. States for 1880, p. 341, t 11, f 1, 1a-d (1881).

The species which Signoret assigns to *D. adonidum*, Linn. is described thus :—

♀. Long,  $2\frac{1}{2}$ —3 ; broad,  $1\frac{1}{2}$  millims. White, a little yellowish : a median dorsal band, brown ; feet and antennæ a little brownish, powdered with a large quantity of farinose matter secreted by spinnerets or pores scattered over the entire body : besides this, each lateral lobe or segment presents a secretion which forms a more or less long woolly appendage around the entire body, increasing in length towards the end of the abdomen, where there are four much larger appendages, of which the two internal are the longest and extend to end of, or beyond the body. Antennæ 8-jointed, of which the eighth is the longest, then the third and second, the fourth and fifth are of equal length and shortest, the sixth and seventh a little longer than the fourth and fifth ; there is a slight pubescence especially at the tip of each joint. Feet rather long with a rather spare pubescence ; tibiæ twice as long as the tarsi ; claw stout and long with slender digitules, which are furnished with a very small knob at the tip, abdomen with a more or less distinct and rounded cicatrix on the sutures of the 1-2 segments and the median line ; an oblong cicatrix on the sutures of the 5-6 segments on each side nearer the margin than the median line ; on each segment a large number of spinnerets in the shape of rounded dots and some scattered hairs. Each lateral lobe presents a space with rounded spinnerets and two more or less stout, conical spines which form the apparatus for secreting the cottony matter of which each lateral appendage is made : those of the lobes of the extremity of the body have a much larger number of spinnerets and the two conical spines are also much larger ; a little lower down, two hairs arise, of which one is large, around these is condensed the secretion furnished by the spinnerets. The genito-anal ring is very broad, punctured, and furnished with six rather long hairs.

♂. The larvæ undergo the change in a cottony envelope and their

antennæ are 7-jointed. The adult is long of a brown neither yellow nor red, with the segments paler; as it grows older, the colour deepens especially on the head and corneous portions of the pronotum: tegmina long, broadly rounded, of a more or less deep grey, reddish towards the side: halteres long, yellow, with a single recurved bristle at the tip: pronotum long, rounded on the sides, straight in front, rounded behind, with a blackish arch on the mesonotum. Abdomen long, ending in a rounded, thick armature furnished with some hairs: lateral lobes of each segment presents two long filaments of a white cottony substance secreted by a group of rounded spinnerets, in the midst are two long hairs and a smaller, around which the matter secreted is condensed; the lobes above have much smaller ones with but 2—3 rounded spinnerets. Head thick, in the form of a ball or a little truncated in front, more convex beneath than above and pubescent, except on the pigmentary circle of the eyes and ocelli of which there are perhaps four. Feet long, with a broad tarsus, flat, pubescent, presenting a very long and narrow hook or claw; the digitules of the tarsi are not thicker than ordinary hairs and have a very small knob at the tip.

♀. The larva varies in size with its age, is flatter, of the same elongated form and same colour but the antennæ are 6-jointed.

♂. The larva is of a uniform shape but more elongate and the antennæ are 7-jointed. The moult preceding the imago state is often indicated by a rolling up internally of the rostral filaments and sometimes by the future antennæ and tibiæ, the latter of which are already indicated interiorly in the members of the larva. (*Sign.*)

Mr. J. Nietner (*l. c.*) describes the Ceylonese form of this insect as follows:—

♀. Apterous, oval, brownish-purple, covered with a white mealy powder which forms a stiff fringe at the margin (one tooth or tuft to each segment on either side) and at the extremity of the abdomen 2 setæ. The dorsum has three longitudinal and a number of transverse corrugations, the latter corresponding with the number of segments: upon each of the three longitudinal corrugations, the mealy secretion forms a sort of ridge-cap. The antennæ, legs, and rostrum are of a light brown colour and slightly pubescent: the antennæ are setaceous, 8-jointed of which the last joint is the longest, nearly as long as the legs and porrect. The rostrum is situate between the first pair of legs, having a few hairs but no sucking bristles at the tip.

♂. Light sordid brownish, slightly pubescent: head rather square, enlarged behind and rounded off at the posterior angles; eyes prominent, black; ocelli two, small, lateral; antennæ 9-jointed, second joint longest, third shortest, 4—9 subequal: [mouth externally re-

presented by two black knobs, resembling blunted mandibles? these are eyes]. Thorax ample, oblong-quadrate, enlarged at the shoulders: wings two, ample, two-veined, hyaline strongly iridescent, laid straight down the back, half overlapping each other when at rest: scutellum ample, transverse, rounded at the apex. Abdomen sub-cylindrical, of shrivelled appearance, with two long anal setæ, which are slightly curled and of a mealy, brittle consistence, being much smaller than the ♀, about  $1\frac{1}{4}$  millims long and in appearance resembles a small may-fly.

♀. Larva or pupa resembles the perfect insect but on a smaller and less perfect scale.

♂. The pupa has the wings and anal setæ rudimental. These imperfect ♂ resemble young *Psoci* or *Aphides* but they carry the antennæ turned backwards along the sides of the body. The larva and pupa are active and can move about.

Nietner (*l. c.*) has the following observations on the *D. adonidum* of Ceylon:—"The insects, in all stages of development, are found all the year round, the propagation being continuous. It appears to me, however, that the ♂ are more plentiful about June and January than at any other season. They affect dry, hot localities, and are found both on the branches and on the roots of the trees to about one foot below the surface of the ground. The eggs are actually laid and enveloped in a white cottony substance and are oval and of a yellow colour." Perhaps there are two species as some are rather flatter and more densely covered with meal, but these may be only local varieties. The white scale-insect attacks orange, guava, and other trees, as well as coffee, and is also found on beet-root and other vegetables. It is also infested by parasites, amongst which Mr. Nietner mentions the occurrence of a small mite named by him *Acarus translucens*; a similar mite is reported from America and New Zealand as infesting the egg-envelope of these insects. Mr. Green writes:—"This insect attacks a large number of plants. Upon coffee it is found chiefly among the clusters of berries, and, in this position, not content with the primary damage done by itself, it attracts a species of ant which builds its nest inclosing the colony of *Dactylopius*. On the estates, it is most destructive to young *Chinchona* plants, frequently killing them outright. It is preyed upon by the larvæ of several beetles and also by the larva of *Lucius epius*, a small Lepidopterous insect."

#### Subdivision COCCARIA.

Sign. A. S. E. F. (5 sér.) v, p. 346 (1875).

This group is confined to the genus *Coccus*, which includes the cochénille insect, *Coccus cacti* of authors, used as a dye. It has not the



anal ring of the previous group, which is here replaced by a simple hairless opening placed at the extremity of the abdomen: eyes smooth, two ocelli: antennæ in the adult ♀ only 7-jointed; larval ♀ with 6 and larval ♂ with 7 joints. The species recorded are from N. and S. America, China, Australia, New Zealand, and Rodriguez island.

#### Subdivision MONOPHLEBARIA.

*Monophlebites*, Sign. A. S. E. F. (5 sér.) v, p. 350 (1875.)

This group is formed for those species of the sub-family *Coccina* in which the ♀ has 11 joints in the antennæ and the ♂ has 10 joints; each of these joints has a node or swelling and a whorl of hairs which makes it appear double and has thus led some authors to give 22—25 joints to the antennæ: the eyes are compressed with numerous facettes but there are no ocelli in the ♂: instead of the ciliated anal ring of the *Dactyloparia*, we have a single ring placed before the extremity of the abdomen. The group includes the following genera:—

1. Covered with a cottony matter varying in colour and with a secretion of still larger filaments: two horn-shaped digitules on the claw and two on the tarsus but without knobbed tips: antennæ in ♀ with 11 joints; in larva 6-jointed with a long pubescence: genital apparatus ending in a tube internally with a reticulated ring like a sphincter and without hairs at its extremity:—*Icerya*, Sign. [l. c. 351: Comstock, Rep. Dep. Agr. U. S. for 1880, p. 347].

2. As preceding: the pubescence very long with two knobbed hairs on the last joint of the antennæ: no digitules:—*Guerinia*, Targ. [Sign. l. c. 352].

3. Only nine joints in the antennæ, rest as in *Monophlebus*:—*Drosicha*, Walker. [Sign. l. c. 353: Walker, List Hom. B. M. Sup. p. 306, 1858].

4. Antennæ very long; eyes reticulated: lateral margins of the abdomen in the ♂ without appendages:—*Leachia*, Sign. [l. c. 359].

5. Antennæ with 11 joints in ♀, 10 in ♂: no digitules but simple hairs: lateral margins of the abdomen in the ♂ with rounded tubular appendages: antennæ in ♀ conical, moniliform with a very short pubescence:—*Monophlebus*, Leach. [Sign. l. c. 363].

6. Body covered with a white secretion: antennæ 11-jointed, conical: feet stout, claws short, no digitules: a sparse pubescence in form of spines on the inner side of the feet and of hairs on the outer side: teguments with rounded spinnerets mingled with some hairs and light semitransparent spaces:—*Ortonia*, Sign. [l. c. 367].

7. Adult ♀ with 11-jointed antennæ; anal tubercles wanting or obsolete: no rostrum but merely an œsophageal opening:—*Cælostoma*, Maskell [Trans. New Zeal. Inst. xii, p. 294, 1880].

#### Genus MONOPHLEBUS, Leach, Sign.

*Monophlebus*, Leach: Westwood, Arc. Ent. i, p. 22 (1845); Walker, List Hom. B. M. iv, p. 1088 (1851): Sign., A. S. E. F. (5 sér.) v, p. 363 (1875).

Species in which the ♀ has eleven joints in the antennæ and the ♂ but ten: eyes reticulated: no digitules on the tarsi or claws, the lateral margins of the abdomen in ♂ with tubular rounded appendages [not plates]: antennæ in ♀ conical, moniliform, with a very short pubescence. ♂ with wings having a single vein which bifurcates sending out one branch which follows the costal margin and another which trends towards the middle of the internal margin but does not reach it.

#### MONOPHLEBUS ATRIPENNIS, Klug.

*Monophlebus atripennis*, Klug, Burm. Handb. Ent. ii, (i) p. 80 (1835): Westwood, Arc. Ent. i, p. 22 (1845): Walker, List. Hom. B. M. iv, p. 1088 (1851): Sign., A. S. E. F. (5 sér.) v, p. 364 (1875).

Adult ♂ fuscous-black: abdomen, scutellum and base of wings obscurely coccineous, with a somewhat frosted white appearance: antennæ longer than the body, very hairy: wings piceous, with two hyaline-white lines: abdomen flat, hairy, incisions between the segments deep, and two flesh coloured, apical, hairy (a millim. long) appendages (Westw.). Body long,  $7\frac{1}{2}$  millims.

Reported from India, Java.

#### MONOPHLEBUS DUBIUS, Fabr.

*Chironomus dubius*, Fabr., Syst. Antliat. p. 46.

*Monophlebus fabricii*, Westw., Arc. Ent. i, p. 22 (1845): Sign., A. S. E. F. (5 sér.) v, p. 365 (1875).

*Monophlebus dubius*, Walker, List Hom. B. M. iv, p. 1088 (1851).

Adult ♂, deep black, shining, margin sanguineous: abdomen black; apex flat, bifid, rufous; lobes with three elongate porrect hairs: wings deep black, with two hyaline-white lines: feet black (Westw.).

Reported from Sumatra.

#### MONOPHLEBUS LEACHII, Westwood.

*Monophlebus leachii*, Westw., Zool. Journ. ii, p. 452: Arc. Ent. i, p. 22, t. 6, f. 1 (1845): Walker, List Hom. B. M. iv, p. 1089 (1851): Sign., A. S. E. F. (5 sér.) v, p. 365, t. 9, f. 5, 5a (1875).

Adult ♂ piceous black, abdomen and pronotum fuscous flesh-coloured, scutellum whitish: wings piceous with two hyaline-white lines: antennæ very long 25-jointed (?): abdomen flat, incised at the apex, the five last segments emitting on each side a long pilose appendage (increasing in length) (*Westw.*) Body long, 7: last lateral appendage 2: antennæ  $8\frac{1}{2}$ : exp. teg.  $16\frac{3}{4}$  millims.

Reported from Malabar, Pondicherry.

#### MONOPHLEBUS SAUNDERSII, Westwood.

*Monophlebus saundersii*, Westw., Arc. Ent. i, p. 22 (1845): Walker, List Hom. B. M. iv, p. 1089 (1851): Sign., A. S. E. F. (5 sér.) v, p. 367 (1875).

Allied to *M. burmeisteri*, Westw., but much smaller, covered with a white-farinose powder and with the lateral appendages of the abdomen shorter: head, antennæ, feet and dorsum of thorax brunneous-fuscous; sides of thorax and the abdomen testaceous flesh-colour, the latter furnished on each side with four short, hairy, lateral appendages, the basal very small, the apical longer and between them two about one half smaller than the last, wings fuscous, posterior margin dilated, with two hyaline-white lines: genital organ stout, cylindrical, curved, longer than the apical appendages, thicker at the apex and truncated (*Westw.*). Body long, 4—5: exp. teg. 14—15 millims.

Reported from N. India.

#### MONOPHLEBUS BURMEISTERI, Westwood.

*Monophlebus burmeisteri*, Westw., Arc. Ent. i, p. 22, t. 6, f. 2 (1845): Walker, List Hom. B. M. iv, p. 1089 (1851): Sign., A. S. E. F. (5 sér.) v, p. 367 (1875).

Adult ♂ piceous-black; pronotum and abdomen fuscous flesh-colour; scutellum and a band between the wings, whitish: wings broad, piceous, a little paler at the base, and with two hyaline-white lines: antennæ longer than the body: abdomen with five long, hairy appendages on each side. Differs from *M. leachii*, Westw., in its shorter wings, posterior margin more rounded and longer abdominal filaments (*Westw.*). Body long, 5—6: cum teg. 16: exp. teg. 13-14 millims.

Locality unknown but most probably N. India.

The following genera belonging to the sub-family *Coccina* are for various reasons not yet arranged under any group:—*Callipappus*, Guérin; *Porphyrophora*, Brandt; *Margarodes*, Guilding; *Orthezia*, Bosc; *Walkeriana*, Sign.; *Llaveia*, Sign.

*Callipappus*, Guérin, has the eyes with facettes found in the genus *Monophlebus* and the anterior feet are like the rest: it has numerous fragile filamentary appendages secreted by the two penultimate segments as in *Porphyrophora*. The ♂ has antennæ with 11 joints, some-



times only 10, each joint becoming more and more long from base to tip: eyes with facettes, below them an ocellus: abdomen slightly lobed on the sides: genital organ very long, twisted several times and like a portion of the intestine accidentally protruded: above and at the tip of the 5—6 segment are a number of spinnerets forming transparent fragile filaments in shape of a tuft that extends well beyond the abdomen: feet long, tarsus one-third shorter than the tibia and having at the tip a small supplementary articulation; a single claw with a hair on the inner and outer face: halteres broad and stout with a small hook at the extremity, on the side. The ♀ has 10-jointed antennæ, of which the first is very broad and short, the second as broad as long, and the rest increase in length and diminish in breadth: rostrum a little below the insertion of the first pair of feet, which are like the rest. The single species recorded under this genus comes from Australia [Sign., A. S. E. F. (5 sér.) v, p. 374, 1875].

*Porphyrophora*, Brandt, has, in the ♂, antennæ moderately long, 9—10-jointed: eyes very large with facettes, touching each other beneath: first pair of feet short; tarsi, tibiæ, and claws not longer than the femora; the claw soldered to the tarsus; the other feet as usual, but no digitules, though all the tibiæ and tarsi have some spiny hairs on the internal margin: 5—6 segments of the abdomen, above and towards the upper margin, have a band or row of spinnerets whence arise a large quantity of light, transparent filaments that form a tuft extending well beyond the abdomen: the latter has at the anal extremity a stout elongate tubercle furnished with a hook-shaped style of which the free portion is fine and long: wings very large: adult ♀ is proportionately much stouter than the ♂ and has no trace of a rostrum: in the larva, the rostrum appears between the intermediate pair of legs. The species hitherto recorded of this curious genus belong to Europe and Asia Minor and include the *P. polonica* and *P. hamelii* which are used for dyeing [Sign., A. S. E. F. (5 sér.) v, p. 377, 1875].

*Margarodes*, Guilding, includes a curious West-Indian species which is inclosed in a calcareous, nacreous, envelope of such consistence as to be used as a bead for necklaces, hence its vulgar name *perle de terre* [Sign., A. S. E. F. (5 sér.) v, p. 385, 1875]. A species has been recorded from S. India. Specimens of Indian and W. Indian puparia are in Indian Museum.

*Orthezia*, Bosc. [= *Dorthesia*] has the ♀ apterous and the ♂ winged and eyes with facettes, but varies so much in the different stages of its existence that it is necessary to study the whole series before a particular form can be assigned to its proper stage in the development of the insect. The young larva has 6 joints in the antennæ, the larval

♀ has 7, others have 7 joints, with a sort of scape as in the Hymenoptera, and the tibia and tarsus in one, and the adult ♀ has 8 joints in the antennæ. No species of this genus has as yet been recorded from India; it is described by Signoret [A. S. E. F. (5 sér.) v, p. 386, 1875] and Douglas [Ent. Mon. Mag. xvii, p. 172, 203, 1881] and need not be further noticed here.

Genus WALKERIANA, Signoret.

A. S. E. F. (5 sér.) v, p. 390 (1875).

♀. Antennæ with ten short joints, 2 and 10 of equal length and longest: body in its normal state covered with a great number of yellow hairs mingled with a white, calcareous, lamellar secretion which, when removed, shows the body to be like that of a ♀ of the genus *Monophlebus*. The skin has rows of spinnerets differing as they produce the pilose or calcareous secretion: feet robust, of moderate length and of the usual appearance; claw stout, with a hair on each face; the tarsi one-third as long as the tibiæ which latter are longer than the femora. At the anal extremity before the margin, the genital ring is surrounded by a great mass of large hairs: above on the penultimate segment, are three cicatrices, of which the median is transverse, roundly oval, and the lateral are longitudinal oval.

WALKERIANA FLORIGER, Walker.

*Coccus floriger*, Walker, List Hom. B. M. Sup. p. 305 (1858).

*Walkeriana floriger*, Sign., A. S. E. F. (5 sér.) v, p. 391 (1875).

Dark red, elliptical, white above, with a double row of lateral, truncated, yellowish-white, elongated appendages, and with some silky hairs: forepart with some dorsal porrect appendages of the same shape (*Walker*). Long 6—7 millims.

Signoret (l. c.) describes the adult ♀ as forming a many coloured pilose mass, yellow, more or less light, more or less tawny, with white calcareous plates strewn regularly over the upper surface and on the sides of the abdomen: the yellow pubescence is longest and most abundant on the thorax, especially on the median line, which causes the white secretion to be less visible: beneath, the entire body is entirely margined with white plates: abdomen with a slight white efflorescence; segments visible and each more and more emarginate as they approach the tip, the median part of the last segment reascending as far as the basal third of the abdomen with the anal or genital opening, around which is a considerable mass of long hairs. Antennæ blackish, with ten joints of which the first is stout and short, the second and tenth are longest; at the tip of each joint is a circlet of short hairs and there

are also some on the disc; at the extremity of the tenth joint there are two long hairs and a number of short ones: feet blackish, rather long.

Reported from Ceylon.

*Llaveia*, Sign., created for a Mexican species which approaches *Porphyrophora* in the form of the first pair of feet and *Monophlebus* in the number of the antennæ. [A. S. E. F. (5 sér.) v, p. 370, 1875].

*Tessarobelus*, Montr., created for a species from New Caledonia in 1864, [An. Soc. Linn. Lyon, xi, p. 246, 1864, and Sign., A. S. E. F. (5 sér.) vi, p. 600, 1876].

Dr. J. Anderson, in his 'Letters to Banks' (1786—89), quoted by Signoret, has noticed and named several species of *Coccidæ* from the Madras Presidency, but his descriptions are so meagre and imperfect that but little use has been made of them. Amongst those mentioned by him are the following:—

1. *Coccus chlæoon*, found on the *Aira indica*, and which Signoret would refer to *Dactylopius* [A. S. E. F. (5 sér.) vi, 612, 1876].

2. *C. oogenes*, found on the *Phyllanthus emblica*, *Euphorbia hirta*, *Tinospora cordifolia*, and *Hibiscus populneus* in Madras. Anderson describes this species as purple-red and surrounded by a silky material of which the threads are as fine as those of a spider's web and can be drawn out to several inches before they break: the adult ♀ deposits her eggs in a silken receptacle and had no rostrum: the ♂ is of an amber colour [Sign., l. c. 621].

3. *C. trichodes*, found on the guava, *Anona squamosa*, *Solanum lycopersicum*, and *Hibiscus rosa-sinensis*: Signoret would refer it to *Dactylopius*. The ♀ is inclosed in silken threads which fall off when she deposits her eggs and serve to hold the young on the food-plant: ♂ of an amber colour with two opaque white filaments which are longer than the body; wings uncoloured and transparent, but after a few days slightly crimson: antennæ 10-jointed and on each joint a few hairs: segments of abdomen visible; limbs pubescent [Sign., l. c. 625].

4. *C. erion*, found on the orange, *Robinia mitis*, *Hibiscus rosa-sinensis*, *Ficus indica*, *Erythrina corallodendron*, *Cocos nucifera*, and *Myrtus zeylanicus*: Signoret assigns it to *Dactylopius*: of a purple orange or a chocolate brown. [Sign., l. c. 615.]

5. *C. microogenes*, found on *Vitis vinifera* and *Galega prostrata*. Of a deep red, with a bright white silky covering, the red disappearing in the advanced stage: ♀ with the margins rimmed and becoming sometimes dull grey and sometimes scarlet: ♂ with two wings which when closed are twice as long as the abdomen and two long filaments at the anal extremity. Signoret suggests that this may be the same as *Pulvinaria vitis*, [Sign., l. c. 620].



6. *C. koleoo*, found on the egg-plant. Colour diaphanous white, except the antennæ and the extremity of the rostrum, which are of a chocolate brown: they form a cylindrical silky envelope which becomes attached to the food-plant [Sign., l. c. 618].

7. *C. diacopeis*, found on the *Citrus sinensis*: segments of abdomen deeply incised [Sign., l. c. 613].

8. *C. narcodes*, very sluggish, found on *Odina wodier* [Sign., l. c. 621].

